

In the Claims:

1. (Currently Amended) A method for repairing a defect in a photolithographic mask for semiconductor patterning, the photolithographic mask having a first layer with a first thickness and a first light transmittance and a second layer having a second light transmittance differing from the first, the second layer being removable in at least one pre-selected region to form a pattern, the second layer, when intact, causing a selected phase shift in light waves that pass through it relative to light passing through the first layer alone, and, when absent in a region not a subset of the pattern, constituting the defect, the method comprising the steps of:

identifying the location of the defect; ~~[[and]]~~

modifying said first thickness of said first layer in an area that includes said defect to introduce introducing a pre-selected phase change at substantially in said area that includes the defect location-location; and

depositing a material having a preselected index of refraction to a selected thickness such that light passing through said deposited material having said selected thickness and said modified thickness of said first layer has a phase shift substantially equal to said selected phase shift.

2. (Canceled)

3. (Currently Amended) The method according to claim 1 ~~[[2]]~~, wherein the step of modifying the thickness of the first layer ~~at substantially the defect location to a known dimension~~ comprises reducing said causing a reduction in thickness to the pre-selected dimension.

4. (Currently Amended) The method according to claim 1 ~~[[2]]~~, wherein the step of modifying the thickness of the first layer ~~at substantially the defect location to a known dimension~~ comprises causing an increase in thickness ~~to the pre-selected dimension~~ by applying a material of known transmittivity.

5. (Currently Amended) The method according to claim 4, wherein the applied material of known transmittivity comprises more than one layer, each being of a material having known transmittivity ~~transmittivity~~.

6. (Original) The method according to claim 1, comprising the further step, prior to modifying the thickness of the first layer, of removing a portion of the second layer adjacent the defect to create a repair zone.

7. (Currently Amended) The method according to claim 6 ~~[[3]]~~, wherein the removal of the portion of the second layer adjacent the defect to create the repair zone comprises removing a portion of the second layer having regular geometry.

8. (Original) The method according to claim 7, wherein the regular geometry comprises at least one rectangle.

9. (Currently Amended) The method according to claim 7, wherein the regular geometry comprises at least one curvilinearly ~~curvilinearly~~-shaped portion.

10. (Currently Amended) The method according to claim 1, ~~wherein the 6, comprising the~~
~~further step of depositing at substantially the repair zone a material comprises depositing a~~
material having a pre-selected transmittance.

11.-12. (Canceled)

13. (Currently Amended) The method according to claim 3 ~~[[12]]~~, wherein the reduction in
thickness of the first layer ~~at substantially the defect location~~ comprises a lacuna in the first layer
and wherein the deposited ~~[[the]] material deposited at the repair zone~~ fills the lacuna ~~and the~~
~~repair zone~~ to a depth having an average value substantially equal to a pre-selected value.

14. (Currently Amended) The method according to claim 1 ~~[[12]]~~, wherein the selected
~~thickness pre-selected value of the average depth of the deposited material deposited at the repair~~
~~zone is computed as a function of at least one physical characteristic of the deposited material.~~

15. (Currently Amended) The method according to claim 13, wherein the selected thickness
~~pre-selected value of the average depth of the deposited material deposited at the repair zone is~~
~~computed as a function of at least one physical characteristic of the material of the first layer.~~

16. (Currently Amended) The method according to claim 13, wherein the selected thickness
~~pre-selected value of the average depth of the deposited material to be deposited at the repair~~
~~zone is computed as a function of at least one physical characteristic of the material to be~~
~~deposited and an at least one physical characteristic of the material of the first layer.~~

17. (Original) The method according to claim 13, wherein the transmittance and index of refraction of the deposited material and the depth of the lacuna are selected to so that light of a known intensity and phase passing through the repair zone following deposition of the material will have a pre-selected intensity, and a pre-selected phase angle relative to a reference phase angle, upon emerging from the photolithographic mask.

18. (Currently Amended) The method according to claim 1 [[13]], wherein the pre-selected phase of the light emerging from the photolithographic mask is at a phase angle of substantially 180 degrees relative to the light incident on the photolithographic mask.

19. (Withdrawn) A photomask for use in the fabrication of integrated circuits comprising: a first layer; a second layer having a primary and substantially constant thickness and a region of altered thickness, the altered thickness causing a pre-selected phase shift in light passing through it relative to the phase of light incident upon the region of altered thickness.

20. (Withdrawn) The photomask according to claim 19, wherein the region of altered thickness of the second layer comprises a region of reduced thickness.

21. (Withdrawn) The photomask according to claim 20, wherein the reduction in thickness comprises a reduction having a pre-selected magnitude.

22. (Withdrawn) The photomask according to claim 20, wherein the magnitude of the reduction in thickness is selected to shift the phase of light waves passing through the area of reduced thickness to a pre-selected degree relative to light waves incident upon the area.

23. (Withdrawn) The photomask according to claim 20, wherein the first layer comprises a material that has been removed at a location substantially overlapping the region of reduced thickness of the second layer.
24. (Withdrawn) The photomask according to claim 21, further comprising a repair material at the location in the first layer from which material has been removed.
25. (Withdrawn) The photomask according to claim 21, wherein the repair material has a transmittance falling in a pre-selected range.
26. (Withdrawn) The photomask according to claim 25, wherein the patch material has an index of refraction falling into a pre-selected range.
27. (Withdrawn) The photomask according to claim 26, wherein the magnitude of the reduction in thickness of the first layer is selected at least in part on the basis of a physical characteristic of the repair material.
28. (Withdrawn) The photomask according to claim 27, wherein the physical characteristics of the patch material forming a basis for the selection of the magnitude of the reduction in thickness of the first layer comprises an index of refraction of the material.
- 29.-31. (Canceled)

32. (Currently Amended) A method for patterning a wafer for use in a semiconductor circuit, the method comprising the steps of:

providing a photolithographic mask for producing a pattern on the wafer, said photolithographic mask having a first layer with a first thickness and a first light transmittance and a second layer having a second light transmittance differing from the first, the second layer being removable in selected areas to form a pattern and wherein an intact second layer causes a selected phase shift with respect to light passing through the first layer alone;

identifying a defect in the photolithographic mask and the location of the defect on the mask;

modifying said first thickness of said first layer in an area that includes said defect to introduce ~~introducing~~ a pre-selected phase change in said area that includes ~~at substantially the~~ location of the defect; ~~repairing the defect; and~~

depositing a material having a preselected index of refraction to a selected thickness such that light passing through said deposited material having said selected thickness and said modified thickness of said first layer has a phase shift substantially equal to said selected phase; and

transmitting light through the photolithographic mask to the wafer to pattern the wafer.

33.-34. (Canceled)

35. (Original) The method according to claim 32, wherein the first light transmitting layer comprises a substantially transparent substrate layer.

36. (Original) The method according to claim 35, wherein the second light transmitting layer comprises an attenuator layer having substantially lower light transmittivity than the substrate layer.

37.-38. (Canceled)

39. (Currently Amended) The method according to claim 32 [[38]], wherein the modification of the thickness of the substrate layer comprises a reduction in thickness of the substrate layer.

40. (Currently Amended) The method according to claim 39, wherein the degree of the reduction in thickness of the substrate layer is pre-selected as a function of ~~at least one of the first and second light transmission characteristics and a~~ the light transmission characteristic of the repair material.

41. (Canceled)

42. (Original) The method according to claim 32, further comprising the step, prior to the step of introducing a pre-selected phase change, of preparing a repair zone substantially at the location of the defect.

43. (Original) The method according to claim 42, wherein the repair zone is of a regular geometric shape.

44. (Original) The method according to claim 42, wherein the repair zone is of a minimal size still capable of circumscribing the defect.

45. (Canceled)

46. (Currently Amended) The method according to claim 32 [[45]], wherein the deposited material has a thickness, in a dimension perpendicular to the plane of the photolithographic mask, selected to produce a pre-selected phase change of light passing through the repair location, the phase change due to both to the repair material of that thickness and to the substrate of modified thickness.

47. (Original) The method according to claim 46, wherein the substrate and attenuator layers, at sites having no defect, together produce a given phase change and the value of the pre-selected phase change of the light passing through the repair location is chosen to be substantially equal to the phase change due to the substrate and the attenuator layers at sites having no defect.

48. (Canceled)